# USDA-NRCS Soil Temperature and Moisture Team


USDA NRCS
Natural Resources Conservation Service

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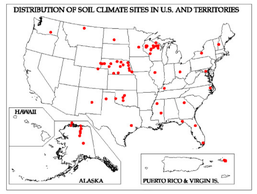
SOIL SURVEY
1899 1999
CENTENNIAL

## Introduction

The USDA Natural Resources Conservation Service maintains a soil climate database. Included in the database are measured values of soil temperature and moisture as functions of depth and time, as well as other selected soil and atmospheric climatic variables. The data are available through the National Water and Climate Center's home page at: http://www.wcc.nrcs.usda.gov. Data for each soil climate station are available directly for the preceding seven days and the entire data record is available via FTP through the Web site. The data consist primarily of hourly measurements collected from the various USDA NRCS Soil Temperature and Moisture Team (STM Team) projects. "Hot links" to other Web sites containing climatic data are available through this Web site. The soil at each station has been described and characterized. The soils information is also available through the Web site. The Soil Temperature and Moisture Team manages more than a dozen projects consisting of nearly 100 soil climate monitoring stations in 25 states and the U.S. Virgin Islands. Many of the projects are cooperative ventures with other government agencies and universities and are designed to expand the area of coverage. Part of this expanded coverage includes global climate change projects in Antarctica and on the Tibet plateau in China. The data from some stations are not yet on-line, but plans are to have all collected data available through the Internet.


## Process

Dataloggers are used to collect data automatically at hourly intervals. Soil temperature and moisture measurement depths depend on the nature of the project and the soil conditions, but generally measurements are made to at least 1 meter. Also, depending on the nature of the project, additional climate information may be gathered. Other climatic variables often monitored include air temperature, relative humidity, wind speed and direction, solar radiation, barometric pressure, precipitation, soil redox potential, and water-quality variables, such as turbidity, pH, $O_2$ content, electrical conductivity, and temperature.



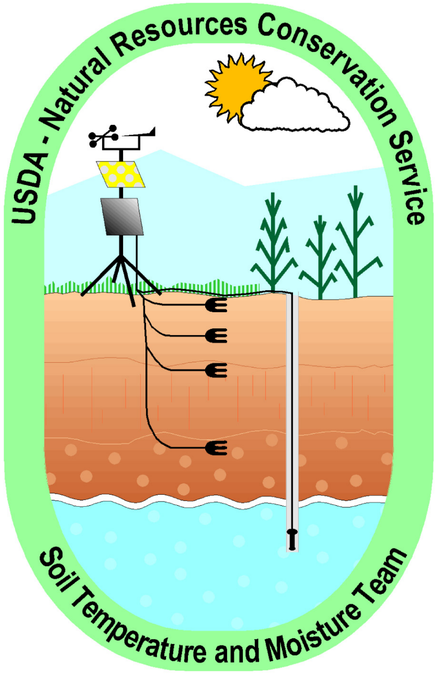


## Projects

Presently, the team is collecting about 55,000 measurements per day, or more than 20 million per year. Some stations have been operational since 1990. Most, however, have been installed after 1995. Data from many of the stations are transmitted directly, in near real time, to computers in the USDA NRCS National Water and Climate Center (NWCC) in Portland, Oregon, via meteor burst radio or cell phone. Data from some stations are manually collected from the dataloggers and electronically transmitted to the NWCC. At some of the extremely remote sites, data are collected only once each year.

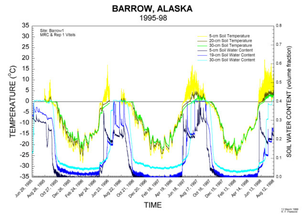
In addition to the long-term climate stations, the SMT Team conducts numerous 1- to 2-year duration soil temperature studies. While these studies are intended to increase our understanding of soil thermal relations primarily for soil classification purposes, the data have a variety of uses. Soil temperature, in these studies, is monitored at two or more depths by temperature microloggers. Often air temperature is also monitored. Several measurements are made each day. Thus far, more than 20 studies, involving more than 200 individual sites in 25 states, have been completed. Fifteen studies are currently in progress. These data are available on the Web at: http://www.statlab.iastate.edu.80/soils/nssc/.

In addition to the various projects involving climate monitoring, the STM Team is evaluating various soil moisture sensors, as well as other types of environmental sensors.



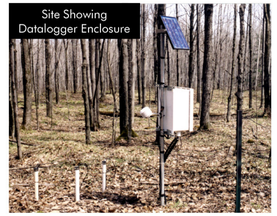

## Project Cooperators

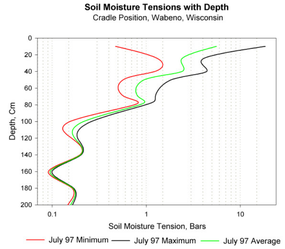
- High Plains Regional Climate Center
- Institute of Glaciology and Geocryology, Chinese Academy of Sciences
- Smithsonian Institution
- University of Alaska Fairbanks
- University of Arkansas Pine Bluff
- University of Cincinnati
- University of Delaware
- University of Pennsylvania
- University of Washington
- USDA Agricultural Research Service
- USDA Forest Service
- USDI National Biological Survey
- USDI National Park Service
- Virginia Polytechnic Institute and State University
- Waikato University




## Uses

Soil temperature and water data are valuable for a diverse variety of uses, including continental scale climate modeling, drought monitoring, irrigation management, soil classification, animal and microbial behavior studies, pollution control, and a variety of engineering applications.




## Conclusion

The NRCS Soil Temperature and Moisture Team has expertise on various types of environmental sensors, dataloggers, data transmission equipment, and data management. They can also provide assistance in environmental monitoring site selection and installation.

For more information, contact one of the STM Team Members listed below.

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